# B U L L E T I N

of the

United States Institute for Textile Research, Inc.

Vol. II February, 1932 No. 2

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Special Course in Textile Research at M. I. T.

U. S. Institute Meetings

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T. R. I. BULLETIN

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Vol. II February, 1932. No. 2

# ADVANCE PROSPECTUS OF RESEARCH ANNUAL

## Topical Outlines of Representative Chapters Show Scope of Volume

Topical outlines of enough of the chapters and sections of the year book, "Textile and Allied Research: A Review of Progress," are now available to prove conclusively that this first volume will approach closely to the ultimate ideals of the board of editors, and provide the industry for the first time, and in one volume for handy study and reference, an up-to-date story of the technological and research status of every important part of the textile industry. Excellent reviews of technical progress have been published annually by several of the textile magazines, but no one publication has ever covered the whole textile field, and none of them have ever surveyed progress in scientific and economic research in a comprehensive manner.

This being the first volume of an annual publication will necessarily devote considerable space in each chapter to a review of progress covering several years, instead of merely reviewing progress during 1931. Possibly a more accurate title for this first volume would be "The Technical and Research Status of the Textile Industry."

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The complete list of subjects to be covered and the contributors is as follows:

Physical Testing Apparatus and Methods.- Prof. H. J. Ball.
Chemical Tests and Methods.
- Analytical.- Dr. Joseph F. X. Harold.
- Finishing.- Mr. H. D. Clayton.
- Dry Cleaning.- Prof. Pauline Beery Mack.
- Laundering.- Mr. George H. Johnson.

Chemistry of Dyeing.- Prof. Louis A. Olney.
Optical Research.- Prof. E. R. Schwarz.
Textile Micro-biology.- Prof. B. E. Proctor and Mr. W. G. Chace.
Fibre Research.- Mr. W. D. Appel.
- Wool.- Dr. J. I. Hardy.
- Silk.- Dr. Walter Scott.
- Rayon.- Dr. H. DeW. Smith.
- Cotton.- Dr. Wanda K. Farr.
- Asbestos.- Mr. J. M. Weaver.
- Bast and Miscellaneous.- Dr. Lyster Dewey.

Technology of Silk Manufacture.- Dr. W. F. Edwards.
Technology of Cotton Manufacture.- Dr. H. H. Willis.
Technology of Woolen and Worsted Manufacture.- Mr. E. D. Fowle.
Technology of Rayon Fibre Manufacture.- Mr. A. K. Johnson.
Technology of Bast Fibre Manufacture.- Mr. S. J. Hayes.
Progress in Textile Machinery Design.- Prof. George B. Haven.
Economic Research.- Mr. H. V. R. Scheel.
Consumer Specifications.- Dr. Gilbert.
Index to Abstract and Bibliography Section, Vol. I, T. R. I. Bulletin.- Mr. C. H. Clark

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## Partial Topical Outlines

The topical outlines of 15 of the subjects to be covered in the volume are tentative in most cases and are subject to additions and revisions. They provide, however, a good idea of the scope and character of the work. It will be noted that it is not only designed to record recent research and technological progress, but is a compendium of most new scientific textile knowledge. In both respects it will be a unique and indispensable addition to textile literature. The topical outlines at present available are as follows:

Physical Testing Apparatus and Methods.- Abrasion, absorbability, atmospheric control, bursting, crimp, heat transmission, porosity, regain, resilience, stretch, tear, tensile strength, thickness, twist and water proofness.

Chemical Tests and Methods (Analytical).- The chemical identification of fibre and fibre classes--water, hardness, character, suitability; chemicals employed in textile processing; intermediates; analytical control of textile processes; sizing and finishing materials.

Chemical Tests and Methods (Laundering).- Improvements in the technical phases of wash room practice: Classification, multiple suds, pH control for souring, special wool washing equipment; color fastness in washing; shrinkage.

Optical Research.- Apparatus: Colorimeters, projection equipment, diffraction apparatus, microscopes (especially for textiles), accessory equipment. Technique: Specimen illumination, specimen mounting, cross sectioning, micrometry, direct color photography, application of polarized light, swelling methods, misc.

Textile Micro-biology.- The relationship of micro organisms to textiles in nature, in the textile industry, and in the finished products; the initial infection of textile raw materials; recognition of such invasions; and summation of means of correcting or preventing subsequent injury.

Fibre Research (Wool).- Discussion of the research on the variations found in fibres as regards fineness, crimp, length, etc.; physical properties; physico-chemical properties; x-ray investigations; new methods of investigation.

Fibre Research (Rayon).- Scientific research: Physical nature of raw cellulose; chemical nature of raw cellulose; spinning solutions, and finished filaments. Technological research: The effect of changes in manufacturing processes on physical and chemical characteristics.

Fibre Research (Asbestos).- Fibre characteristics: Ease of separation, strength, length, flexibility, fineness and lustre; non-inflammability; resistance to high temperatures; heat and electric conductivity; impurities present; resistance to acid and alkali.

Fibre Research (Bast Fibres).- Soft fibres: Flax (blend breeding and selection, experiments on time of harvesting, chemical fertilizer and soils); hemp (breeding and selection, experimental cultivation); ramie (identification of different strains, studies in degumming and decortication). Hard fibres: Abaca, (cultivation, grades, yield,and price formulas); sisal (results of cross breeding, characteristics of sisal and other agaves).

Technology of Cotton Manufacture.- Picking: One process-opening, cleaning, blending; stabilized atmosphere; uniform laps; oil spraying. Carding--card clothing; cork rolls; drafts. Spinning--long draft. High speed warping, winding, spooling. Slashing--scientific control. Weaving--loom improvements. Humidification.

Technology of Woolen and Worsted Manufacture.- Wool: Garnetting; combined garnett and card; improvements in blending; broad-band, intermediate card feed; tape condenser; ring spinning. Worsted: Square-motion comb; intersecting gill box in the Bradford system; porcupine drawing of oil-combed stock; ring spinning, and high speed weaving.

Technology of Rayon Manufacture.- Improvement in existing processes for spinning; improvements in packaging; reduction of costs.

Technology of Bast Fibre Manufacture.- Fibres: Varieties, function, structure, constitution, isolation. Manufacturing processes: Purpose, method, preparing, drawing, roving, spinning, finishing; humidification; laboratory studies.

Progress in Textile Machinery Design.- Adoption of dynamic balancing to eliminate vibration; closed systems of lubrication, utilization of ball and roller bearings; utilization of alloys; use of cut gears; precision grinding; increased use of automatic mechanisms.

Economic Research.- The seller's market vs. buyer's market; fundamentals of the present industrial economic situation; five periods of competition; triangle methods of analysis; Textile Foundation's marketing studies; coordination of production with consumption; statistical methods for sections of the textile industry; uniform accounting; costing methods.

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## Adequate Indexes

"Textile and Allied Research: A Review of Progress" will be a cloth-bound volume of more than 200 pages, with overall dimensions of 9x6¼ ins. and text pages of 6½x4¼ ins. The text will be adequately indexed and cross-indexed and the volume will also contain a complete classified index of abstracts and bibliography published in the 10 numbers of Vol. I of U. S. Institute's Official Bulletin.

## Advance Orders Sought

Selling price of the work will be largely determined by the size of the first edition, but will not be more than $3 to members of U.S. Institute. If each member would forward the appended advance order for enough copies to supply the key men of his organization it might make possible a much lower sales price:

C. H. Clark, Sec.,
U.S.Institute for Textile Research,Inc., 65 Franklin St., Boston, Mass.

Enter my order for copies of "Textile and Allied Research: A Review or Progress" at a cost per copy of not more than $3, and with your guarantee that I shall be given the advantage of any lower price per copy that may be made possible by advance sales.

Signed _____

# TEXTILE RESEARCH IN GREAT BRITAIN

Progress Reports of Wool and Cotton Research Associations for Year Ended July 31, 1931.

The British research associations for the textile industries render annual progress reports to the Department of Scientific and Industrial Research, a governmental body administering research funds for all British industries. Believing that the programs and methods of the British wool and cotton research associations may be of scarcely less interest to U. S. Institute members than research results, the complete reports of the British Wool Industries Research Association and of the British Cotton Industry Research Association, for the fiscal year ended July 31, 1931, are reproduced as follows:

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## REPORT OF WOOL INDUSTRIES RESEARCH ASSOCIATION

The attention of the Association's workers has been directed to the examination of the fundamental basis of wool sorting. They have been able to establish the laws underlying this commercial process, and from the knowledge so obtained has been built up the possibility of international agreement with regard to wool appellations. This is of great practical importance to the trade. Instruments have been devised for the assessment of the different qualities of wool used throughout the world.

The early mechanical stages of processing have been intimately analysed. Starting from purely theoretical grounds, the function of each intimate part of the carding machine was duly examined, even down to such small details as the exact function and performance of a single card wire. After mathematical and geometrical analysis, certain conclusions led to the design of a much smaller machine than that usually employed in commercial practice. Whereas, ordinarily, five or six cylinders may be used in the mills, the Association's workers established highly satisfactory commercial results using only two. The machine takes up one-third of the space in the mill, and the consequent reduction in capital outlay, power, supervision, cleaning, etc., is obvious. The results obtained from this machine have been carefully checked against those obtained on the same blends processed under ordinary conditions in the mills. Invariably the wool treated by the Association has produced satisfactory results, and in many cases superior handle of the cloth has been obtained. This machine, in combination with the woollen spinning frame previously designed and introduced by the Research Association effects an enormous saving in the carding and spinning processes, both in capital outlay and in current expenditure.

### New Worsted Spinning Principle

On the worsted side it has been found necessary, in order to meet foreign competition, to design a machine capable of the manipulation of short fibre rovings. The machine evolved at the Research Association's laboratories

incorporates a new principle of worsted spinning giving effective control of fibres down to three-quarters of an inch in length. It is thus possible for the ordinary Bradford spinning frame to be adapted, with comparatively small financial outlay, to spin yarns of the Continental type superior to those produced on the mule. This machine affords an opportunity for the English worsted spinner to enlarge the scope of his existing machinery in order to meet foreign competition with comparatively small expenditure. Samples of the yarns produced by this machine have received favourable trade comment, both from hosiery manufacturers and spinners of worsted yarns.

## New Products Resembling Leather

The search for new uses for wool led to an attempt to treat wool yarns with nitro-cellulose and cellulose acetate in order to produce new effects other than those obtained by mechanical admixture of rayon fibres. With a mixture of cellulose, leather, rubber and wool, all in suitable form, various products were made which strongly resembled leather. After laboratory experiments were complete, bulk samples were tried out, and at the present time the various uses to which these can be put, namely, gloves, manufacture of boot uppers, leather coats with wool linings complete, upholstery, etc., are all being explored. Wool has been found to present peculiar characteristics rendering it specially suitable for these purposes, and although a special fabric treatment is involved, the Research Association's workers have now succeeded, in co-operation with various practical agencies, in overcoming a great number of the difficulties originally presented.

## New Bleach Requires Scientific Control

To turn to the finishing processes, mention should be made of the new process now successfully launched on a mill basis for the bleaching of wool. As a result of the pure chemical research carried out on the action of sulphur dioxide upon dyestuffs, it has been shown that the cause of hitherto mysterious off-shade effects, due to what eventually proved to be contact with sulphur fumes, is the existence of an "active range" in the relative amounts of sulphur dioxide and alkali brought into contact with the dye. This effect is due in some cases to formation of addition compounds which are much lighter in colour than the original dye, and in other cases to actual reduction of the dyestuff. While the underlying action in stoving is not completely understood, it is generally regarded as involving either the formation of a relatively coloured additive compound with the colouring matter in the wool, or the actual reduction of the colouring matter. The fact that the "active range" condition gives a maximum effect in either case with these dyestuffs, though they are fast to stoving, suggested that its application to the bleaching of the natural colour in wool presumably involving a similar mechanism would produce results beyond that of ordinary stoving. Experimental support of this view has been obtained and "active range" conditions have produced a type of bleach one important characteristic of which is its relative permanence to washing. Also the finished fabrics are free from smell. It requires careful control, but is now being carried out successfully under mill conditions, and bulk manipulation has been accomplished. The British manufacturers who have adopted this process found that flannel garments laundered twelve times have come up whiter than in their original state. Whilst no great economy in the cost of processing has been effected, yet results superior to anything previously obtained, and better than those possible under Continental conditions, are now an accomplished fact in the industry.

## New Ring Frame Encounters Buyer Resistance

As illustrating the difficulties encountered in securing the adoption of a new material or process in industry, the case of the ring spinning frame produced by the Association is of special interest.

The Association's woollen ring spinning frame has made it possible to produce a good sound yarn, of a higher degree of levelness than the mule yarns, with no periodic variations, and also of the requisite degree of softness of a mule-spun yarn, together with the mossy character and felting properties desirable in carded woollen yarns. A further feature of the machine is the high draft employed. This results, in actual manufacture, in the condensing of the slubbing being possible to a much thicker count; that is, the same count of yarn can be derived from a thicker slubbing. Further, it is possible to spin up to a count of 70 skeins in woollen, which is phenomenal and in advance of that ever attained by the mule. Drafts up to $3\frac{1}{2}$ have been obtained on the machine, but on normal working a draft of $2\frac{1}{2}$ to 2 has proved eminently satisfactory.

The frame produces considerably larger output per spindle, in consequence of the continuity of working. Actual figures have shown that, taking into consideration the spinning frame alone, the production per spindle is nearly $2\frac{1}{2}$ times that of a mule spindle, whilst, with the additional advantage of a thicker slubbing, the combined card and frame render actual production even higher.

With regard to costs it is estimated that, taking into consideration the reduction in power, labour, and the higher production, etc., but not taking account of economies due to the smaller space occupied in the mill, the yarn should be produced at least at about half the cost of the ordinary mule yarn.

In order to have a thorough test of the capabilities of the frame on all types of material, over 70 different manufacturers, representing all sections of the trade, have submitted their own slubbings for spinning on the frame. In all cases satisfactory results have ensued.

Notwithstanding the proved advantages of the ring over the mule spinning frame the installation of the frame in mills is proceeding slowly. This is attributed to the following reasons:

(1) The lack of inclination to purchase new machinery at a time when, owing to paucity of business, the old machines are not sufficiently employed and replacements are considered superfluous.

(2) The replacement of a mule spinning machine by one of the frame type involves an almost new technique in the woollen section of the industry. The worsted side is more familiar with spinning frames than the woollen, and tuition and instruction of the woollen spinner are often necessary to enable him to manage the new spinning frame efficiently.

(3) The final patterns for mass production manufacture of the frame have only been completed during the last twelve months.

(4) Many attempts in the past have been made to design woollen ring frames, with comparative failure. The ring spinning frame has thus to overcome a prejudice against such machines.

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## REPORT OF COTTON INDUSTRY RESEARCH ASSOCIATION

During the past year the new technological department of the Shirly Institute has been completely equipped with machinery representative of modern practice in all branches of spinning and weaving. This new extension has already amply justified itself, and since its erection the spinning machinery has been in constant employment for a variety of purposes. The spinning tests on cottons produced by the Empire Cotton-Growing Corporation are now carried out at the Institute under complete supervision throughout; each cotton is spun to more than one count, and an attempt is made to spin it to the limiting count for which it appears to be suitable. The spinning test provides a necessary link in the chain of research that leads to the introduction to the industry of new and improved varieties of cotton. Extended investigations have been and are being carried out on the processing to different types of cotton, including a study of the several variable factors that affect the quality of the yarn finally obtained. Further, by means of the new machinery, the causes of imperfections in the spun yarn reported by members can be investigated, and in many cases a suitable remedy can be prescribed. None of these developments was possible on anything like the same scale prior to the establishment of the new technological department.

The performance of two machines which have been developed at the Shirley Institute for use in the spinning processes is at present being investigated. These machines are the Shirley card and the Shirley ring frame. For many cottons the Shirley card appears to be quite as satisfactory as the standard card, and has the two advantages that it is much cheaper and occupies less floor space . The new ring frame is still in an experimental stage.

### Sizing and Weaving Studies

On the manufacturing side, the new rooms contain a complete range of machinery for winding yarn, forming warps, and for sizing and weaving. This equipment is being used primarily for the continuance of the work on the effect of variations in sizing on the weaving quality of warps, though other factors which affect the performance of the warps in the loom and the character of the cloth woven will also be made the subject of special investigations.

The operations of sizing and weaving are at present imperfectly analysed and ill-described, so that it is impossible to put forward laboratory apparatus that simulates the physical and dynamical factors operative in industrial machinery. It is for this reason that full-scale machines, precisely similar to those employed in the mills, are now in use for what are essentially laboratory experiments. It is realised that in the analysis of the problems of the industry the new equipment is no substitute for direct observation and discussion in the mills, but it serves as a means of putting to the test specific questions that can only be solved by direct experiment under stricter control than is generally possible on portions of an industrial plant. A programme of experimental work calculated to keep the sizing machines and twenty looms occupied for some time has been commenced, and weaving is now in progress on warps sized at the Institute.

### New Program of Dyeing Research

Problems relating to the dyeing of cotton are of two kinds: (a) those dealing with the way in which the qualities of the dyed material are affected by the nature of the dyestuff and of the dyeing process themselves, and

(b) those dealing with the effect of other processes, such as bleaching and mercerising, on the properties of cotton dyed with different dyestuffs. The problems included under the heading (a) have already received very prolonged and careful attention at the hands of the large dyestuff manufacturers; a great body of systematic information, even if of a somewhat empirical kind, has already been collected, and, in the interests of dyestuff manufacture, has been well disseminated throughout the dyeing industry. It is certain that any serious contribution to these problems will only be made by the Research Association as a result of fundamental studies on the physico-chemical nature of dyestuff solutions and of the dyeing process. The work at present in progress is of this fundamental kind, and envisages a long programme of purely scientific investigation. An essential feature of the investigation is the simultaneous prosecution of a number of related researches dealing, on the one hand, with the size and charge of the dye particles in solution, and, on the other hand, with the effect of temperature and composition of the dye solution on the rate of absorption of the dyestuff by cotton, on the penetration of the dyestuff into the cellulose, and on the equilibrium absorption. Although a number of investigations on the nature of dye solutions are recorded in the scientific literature, there is almost complete absence of exact data which would assist in relating the nature of the dye solutions to the mechanism of cotton dyeing and the properties of the dyed material. By the co-ordinated researches just outlined an attempt is to be made to fill in this technically important gap. Before the main investigation can be initiated as a whole, much preliminary work is necessary in developing methods for each of the separate branches--for example, methods of dyestuff purification and analysis, methods for studying the coagulation of dyes, and the ultra-microscope technique to be used for dye solutions.

## Effect of Metals on Scouring

Prior to the Research Association's work, problems included under (b) above had received much less systematic attention, and it is therefore in this field that laboratory work has proved most fruitful in yielding results of immediate practical interest to the trade. The problems deal with the effect on the quality of dyed cotton of other chemical processes--both preceding and following the dyeing process itself. By far the most important of these is the bleaching process--which normally occurs before dyeing--since any oxidising attack of the cellulose has a very deleterious effect both on the fastness and shade levelness of dyeings. The mechanism of the oxidising attack of cotton cellulose by hypochlorite solutions, and the methods of technical control necessary to avoid such attack, have been mentioned in previous reports. A recent extension of this work deals with the oxidation of cotton cellulose when it is submitted to the action of gaseous oxygen in the presence of caustic alkali--conditions that sometimes arise in the scouring of cotton goods. The kinetics of this reaction have been studied, as well as the properties of cotton materials attacked in this way, whilst remarkable, and to some extent unexpected, effects have been observed when the reaction occurs in the presence of traces of certain metals.

## Peculiar Action of Some Fast-to-Bleaching Colors

In one very important class of cotton materials, namely, striped shirtings, the bleaching process follows dyeing, the stripes being dyed in the yarn with "fast to bleaching" colours before weaving. The necessary conditions

of bleaching are then such as to secure oxidation of the natural colouring matter in the undyed cotton forming the white ground, without significant attack of the colour in the dyed stripes. These are evidently conditions in which close technical control and a complete understanding of the process are even more important than in the simple bleaching of white goods. The Research Association can justly claim a considerable share in the great advance made in this branch of the industry during the last few years, an advance that is still in progress. One observation, the result of systematic work, is likely to prove of peculiar practical importance--namely, the observation that certain fast colours, whilst themselves unaffected in shade during bleaching, are capable of inducing very rapid attack by the bleach liquor on the cotton on which they are dyed. The practical consequence of this is that in a bleached shirting or other cloth the stripe dyed with such a colour rapidly disintegrates in wear, if not before. In view of the large number of fast colours on the market, and the growth of such fresh knowledge, much work is necessitated in the re-examination and classification of dyestuffs in the light of the newer information.

## Rayon Requires New Testing Methods

The work in connexion with rayon has been largely concerned with the development of testing methods. Although rayon is, in many respects, similar to cotton, its testing, both chemical and mechanical, raises many new problems. On the chemical side, progress has been made in the examination of the effect of bleaching agents on rayon and this investigation has demanded the development, and in some cases the modification, of the chemical methods already in use for cotton. Some of these testing methods have also been applied successfully to the analysis of mixtures of ra on with other textiles, and it is now possible, for example, to determine the composition of a mixture of regenerated cellulose (rayon) and natural cellulose (cotton). Methods for the mechanical testing of rayon yarns are also being worked out and the influence of various factors such as the rate of loading, length of test specimen and the relative humidity of the atmosphere in particular, on the tensile properties of these yarns is being studied. Other physical properties, such as the hygroscopicity, the lustre and the whiteness of rayon materials are also receiving detailed attention.

## New Scientific Textile Knowledge Appreciated

One of the outstanding difficulties of the textile Research Associations in their early years was the lack of scientific knowledge on which they could base their operations; consequently the Cotton Research Association has had to devote much of its expenditure and effort to purely scientific research and to delay the investigations of problems of direct industrial importance. It was, perhaps, natural that the trade should at first view such a programme with disfavour, but whatever it may have thought originally, the fact remains that the demand for the services of the staff is now so persistent that it is sometimes almost embarrassing. It is doubtful whether there could easily be found a more striking example of the value, in the long run, and even from a purely practical point of view, of research on the fundamental problems. It is part of the policy of the Association that such researches shall not now be "crowded out" by the pressure of problems of more immediate industrial importance, and that while no effort shall be spared to apply to the utmost the results of completed researches, a balance shall be maintained, both in expenditure and in effort, between the application of scientific facts already acquired and the accumulation of fresh knowledge.

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# CLASSIFIED INDEX
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# ABSTRACTS

COTTON AND LINEN FABRICS: WEAR IN LAUNDERING.- A. ten Bruggencate.
Reprint from Vakblad der Waschindustrie, Feb., 1932.

Three cotton and three linen test pieces were distributed to a number of laundries and submitted 25 times to the usual laundry processes. The warp-way strength of the fabrics was determined before and after washing and the process was judged by the percentage loss of strength of the washed fabric as compared with the original strength. There are several objections to this way of working, chiefly that the processes cannot be controlled in a laundry as in a laboratory, and that whiteness differences are a factor. Nevertheless, though the probable error of the actual values is great, the average values give a general idea of the extent of wear. An average reduction of strength of 23% for cotton and 62% for linen was found. The maximum and minimum values were 37% and 10% for cotton and 81% and 46% for linen. The amount of wear thus varied considerably in the different laundries. A forty-fold washing test has shown that fabrics of high initial breaking load and of the same weight and construction must be used for laundry tests and the test pieces be cut in a specified way, such that the same warp threads run through them. At least three cotton and three linen fabrics should be employed and one cotton and one linen test piece should be washed 25 times in different machines with the usual agents. Graphs are reproduced showing the effect of 5, 10, 25 and 50 washes on the strength of a cotton and a linen fabric.

The laundering was carried out in the same laundry by two different operations and the results illustrate the influence of personal factor. The strength of linen falls very considerably after ten washings, then gradually, whilst that of cotton falls regularly from the beginning. The linen fabric survived 80 times washing by one operative and only 57 times by the other. The cause was found to be that the operative getting the poorer results used too much rinsing water, so that the goods were floated and insufficiently rinsed. The soap and chlorine were not satisfactorily removed, a condition confirmed by graphs of the weight per sq. metre and percentage ash content of the cloths as washed by the two operatives. The value of wear tests in the control of laundry operations is discussed and emphasized, preference generally being given to testing-house tests where the conditions can be better controlled. (Copied complete from the Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932.) (S)

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PHYSICAL PROPERTIES OF RAW SILK.- Keizo Tanahashi.
Journal of Society of Mechanical Engineers of Japan (Foreign Edition), Vol. XXXIII-4, P. 173-175.

Abstract of a paper delivered before the Society at Yokohama, June 7, 1930. The following items are mentioned as those for which tests should be made and a very brief outline of the tests in each case is given: Difference between normal and true average size; evenness of the thickness of raw silk; cleanliness and neatness; cohesion; ultimate strength; elongation; elasticity. The author states that a coefficient of resilience of fibroin can be calculated after stretching 8%. A diagram is given indicating the adaptability of silk of varying resiliences and stiffness for certain definite fabrics. (S)

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RAYON THREADS AND FILAMENTS: REGULARITY.- D. Isolani.
Seta Artificiale, 1930, 2, No. 12, P. 18-21.

Means for controlling the regularity of rayon filaments and threads are discussed. A device for the visual judgment of threads comprises essentially an aluminium plate painted black on which the rayon is wound mechanically in parallel, equidistant turns. A practical, and for industrial purposes sufficiently accurate, method of controlling filament regularity involves separation of at least two metres length of a single filament, winding the filament into a skein and drawing the skein, together with some dark coloured rayon, through a cork by means of a needle and loop. In this way a single cut furnishes cross sections at various parts of the filament. The cross-sectional areas of the photographed and enlarged sections of the filament under examination are then determined with a denierometer, a squared scale so constructed that the area of each large square multiplied by the specific gravity of the rayon gives a value of 1 denier, whilst each small square gives 1/25 denier. (Copied complete from Abstract Section, Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932.) (S)

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AN IMPROVED METHOD FOR REVEALING THE SCALE STRUCTURE OF WOOL AND HAIR.- J. Manby.
Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932, P. T5-T13.

A further modification of the author's method of oblique illumination for the sharp rendition of scale structure. While the mount advocated is essentially in air, a suitable mounting medium, nevertheless, provides not only a support for the fibre--rendering the mount permanent--but also makes the scales on the underside of the fibre invisible. The index of the medium being higher than that of air allows more efficient use of transmitted light with greatly increased definition. (S)

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A METHOD FOR STUDYING THE SCALE STRUCTURE OF MEDULLATED AND PIGMENTED ANIMAL FIBRES.- J. I. Hardy.
Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932, P. T1-T5.

The difficulties encountered in the study of the surface structure of animal fibres have been largely overcome, in the case of white, unmedullated fibres, by correct mounting and illumination. Where pigmented or medullated fibres occur they interfere seriously with these methods. Accurate examination of the scale structure of such heavily pigmented or medullated fibres has presented difficulties, and the photography of the surface structure has not been successfully accomplished. Saxinger and Herzog pressed fibres partially into plastic materials, using the negative impression thus secured for examination and study. These methods furnish an inverted image of only a portion of the circumference of the fibres, and are inadequate for biological studies upon the structure of entire fibres,

The purpose of this article is to present a method in which a plastic material is used, but which is applicable in the accurate examination of the scale structure of all animal fibres, with ordinary laboratory equipment. This method is similar in principle to the impression methods already cited, but furnishes a positive impression of the fibres and presents the entire circumference for examination. Its novelty lies in the fact that it gives a complete cast of the fibres, as shown by photo-micrographs published with this paper. (S)

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PUTTING MICROGRAPHS TO WORK IN THE TEXTILE INDUSTRY.- James A. Austin.
Textile World, Jan. 30, 1932, P. 20-23.

An article relative to the application of photomicrography to mill research as conducted in the laboratories of the Fall River Division of the Pepperell Manufacturing Company. Some of the items which have been subjected to examination are raw cotton, roving, yarn, size, sized warps, and gray and finished fabrics. Particular emphasis was placed upon the control of slashing. Fibre sections are largely used and are prepared by means of the Schwarz metal slide. A number of excellent photomicrographs are included. (S)

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MATURATION OF VISCOSE.- T. Vitale.
Giorn. Chim. Ind. Appl., 1931, 13, P. 476-479.

All the principal theories of this effect regard it as a decomp. with liberation of $CS_2$. In a closed vessel not under vac. maturation is retarded, such retardation being intensified and the proportion of $CS_2$ combined with the cellulose increased in presence of vapour saturated with $CS_2$. Maturation of viscose must be regarded as due, not to hydrolysis of the xanthrate by NaOH, but to hydrolysis depending on decomp. of the xanthate, owing to the volatility of the $CS_2$. As the ratios between the components required by an equilibrated reaction must be maintained, the NaOH is liberated slowly from the compound. Removal of the NaOH which peptises the colloid modifies the conditions of imbibition and swelling of the system. The S of viscose appears to be distributed between xanthate and impurities, that of the xanthate being an aliquot part (80% in the case examined) of the total. The variations of S content with time are independent of the initial contents. (Copied complete from British Chemical Abstracts, Journal of the Society of Chemical Industry, Vol. 51-3, Jan. 15, 1932.) (S)

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VISCOSE. XXXVII. INVESTIGATIONS WITH THE SPINOMETER.- S. Iwasaki, F. Fujita, S. Ri., and E. Sugino.
Journal of Cellulose Institute, Tokyo, 1931, 7, P. 229-234; cf.B.1931,107.

When a standard viscose solution is spun into 10% $H_2SO_4$ alone, the spinnability increases with increasing time of ripening of the viscose, at first rapidly, then very slowly, and finally decreases. If $ZnSO_4$ or $ZnSO_4$-$MgSO_4$ mixture is added to the acid greater spinnability is obtained, which is marked by a sharp max. in the spinnability-time of ripening curve. With addition of glucose, $MgSO_4$, and $ZnSO_4$ the spinnability increases, but the change with increasing time of ripening is small. In all cases the period of max. spinnability is reached after 16--19 days, somewhat later than the time at which min. viscosity of the viscose is reached. In general, the strength of the rayon is greatest when the coagulum is stretched to 70% of the possible max.; with greater stretching, both strength and extensibility diminish, whilst with less, the strength is lower but the extensibility is not greatly affected. (Copied complete from the British Chemical Abstracts, Journal of Society of Chemical Industry, Vol. 51-3, Jan. 15, 1932.) (S)

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THEORETICAL AND APPLIED SILK SOAKING.- Ralph Hart.
American Silk Journal, Vol. 51-2, Feb., 1932, P. 51-54.

A continuation of a series of articles, this one dealing with oxidation, gumming, and rancidity; take-up and efficiency of exhaustion; and tub-soaking versus machine-soaking. (S)

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DETERMINATION OF SUBSTANTIVITIES OF DYES.- W. P. and E. R. Cohoe.
American Dyestuff Reporter, Vol. XXI-4, Feb. 15, 1932, P. 133-138.

An editorial abstract states: "This paper describes a general method for obtaining the adsorption curve of any dyestuff on any fibre. Results have been procured by using the skin-friction machine to obtain a set of dyeings made at known concentrations. A long tapering dyeing is then made under constant conditions, except that the dye is gradually exhausted. A comparison is made of the two sets of dyeings on the General Electric recording spectrophotometer. An integration leads to a final curve which, for its characteristic portion, is a straight line on log paper. Varying conditions of temperature, mercerization, speed, tightness of twist, and the like throw the curve either up or down but do not change its angle."(S)

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RAPID METHODS FOR DETECTING 'DAMAGE' IN COTTON AND WOOL.- A. J. Hall.
American Dyestuff Reporter, Vol. XXI-4, Feb. 15, 1932, P. 105-106, 139.

An editorial abstract states: "Cotton and wool fibres are alike in respect of the fact that they are both protected from weathering and chemical influences by an outer layer. In the case of cotton this layer appears to be a continuous cuticle of highly resistant cellulose, while with wool the protective layer consists of overlapping epithelial scales. Rupture of the cellulose cuticle or the removal of the epithelial scales by mechanical or bacterial influences at once reduces the strength of the fibre and renders it more susceptible to attack and deterioration during the various wet processes involved in scouring, dyeing, and finishing. It is therefore of considerable importance to have available means for detecting "damage" in wool and cotton fibres."(S)

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THE PHYSICAL CHEMISTRY OF THE PROTEINS OF SILK AND WOOL.- Dr. Milton Harris.
American Dyestuff Reporter, Vol. XXI-3, Feb. 1, 1932, P. 78-82, 96.

Largely a discussion of the determination of the iso-electric point of silk with some reference to that of wool. The author states that the iso-electric point is quantitatively noted as the pH concentration of the solution necessary to suppress the ionization of the acid group so that the ionization is equal in both directions. He further stated that the iso-electric point is a point of maximum or minimum properties and it has been shown that solubility, viscosity, and migration in the electric field are all at a minimum at the iso-electric point. He further describes the use of these methods for the determination of the iso-electric point and described an improved device for the micro determination of migration rate. He states the iso-electric point of silk (fibroin) to be 2.2 and of sericin to be from 3.6 to 3.8. The author was not willing to state a definite figure for wool but gave a tentative value of 3.3 to 3.4. (Abstractor's note: Other work has shown the iso-electric point of wool to be near 4.5 in all probability.) (S)

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A STUDY OF THE STRESS-STRAIN CURVE ON RAYON.- Dr. Henry Green.
American Dyestuff Reporter, Vol. XXI-3, Feb. 1, 1932, P. 83-87.

An interesting discussion of a simple method for testing the elastic and plastic conditions of rayon under load. The material used was yarn and was therefore multi-filament. Details of the exact method of test were given and it was stated that the elastic limit for the rayons examined was found to be very low, occurring at a point probably less than 2% of the maximum. (S)

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COLLOIDAL ASPECTS OF THE DYEING OF WOOL WITH ACID DYES.- Herman Boxser.
American Dyestuff Reporter, Vol. XXI-3, Feb. 1, 1932, P. 71-72, 99.

An editorial abstract states: "Explanations for phenomena produced in the application of dyestuffs to textile fibres even to the present advancement of scientific knowledge still remain in the hypothetical stages. At present we do not have one accepted theory of dyeing which covers the coloring of all textile fibres. That dyeing is a phenomenon in which there occurs a true chemical inter-reaction between the dye and fibre appears to be a theory favored by many for the application of acid dyes to wool. However, this theory of a chemical inter-reaction finds a weak foundation when the application of substantive dyes to cotton is considered." (S)

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PLASTICISING OF CELLULOSE ACETATE.- N. Ishii.
Journal Cellulose Institute, Tokyo, 1931, 7, P. 235-243.

A marked increase in the elongation of cellulose acetate film occurs when its content of the plasticiser ($Ph_3PO_4$) is so high that visible crystals appear on the surface of the film; i. e., at a concn. of about 30%. When cellulose acetate films are caused to swell in EtOH containing various amounts of different plasticisors, the alcoholic gel formed apparently acts as a solvent for the plasticisers, which are distributed between the liquid and gel in accordance with Henry's law. The efficiency of the plasticiser towards cellulose acetate increases with increasing affinity, viscosity, and surface tension. Increase of plasticity is ascribed to the permanent swollen state of the cellulose acetate, whereby the mutual cohesive power of the micelles is decreased by the intra-micellar swelling, and the ability of the micelles to slip is increased by the "inner lubricating effect" of the plasticiser. (Copied complete from British Chemical Abstracts, Journal of Society of Chemical Industry, Jan. 29, 1932.) (S)

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BASIC MORDANTS AND LAKES.- Prof. Wilder D. Bancroft.
American Dyestuff Reporter, Vol. XXI-3, Feb. 1, 1932, P. 74-77

A paper presented at the annual meeting of the A. A. T. C. C. in Boston, Dec., 1931. A general discussion of certain work which had been undertaken at Cornell as theses. The conclusions registered were that under dyeing conditions the dye is adsorbed by the mordant and does not form a stoichio-metrical compound with it. It is possible to dye satisfactorily with a peptized lake. Some mordants are good ionizing adsorbents and some are almost non-ionizing adsorbents. This accounts for the different colors of polygenetic dyes on different colorless mordants. If a dye fluoresces in solution and not as a solid, it will fluoresce on an ionizing adsorbent and will not fluoresce on a non-ionizing adsorbent. If Witt had known about ionizing and non-ionizing adsorbents he would not have developed his solid solution theory of dyeing. If there are no other disturbing factors, a dye will be faster to light on the mordant or fibre which adsorbs it the most strongly. If the decomposition products of a dye are adsorbed by the mordant or fibre more strongly than the dye itself, this may cause a reversal of fastness to light. If a colorless mordant acts as an oxidizing catalyst, this may cause a reversal of fastness to light. So far as our experiments go, dyes are faster to light on colored mordants than on colorless mordants. This is probably not always true. (S)

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DETERMINATION OF ACETIC ACID IN CELLULOSE ACETATE.- E. Berl, G. Rueff and W. Wahlig.
Chem.-Ztg., 1931, 55, P. 861-862.

The acetate (0.5 g.) is hydrolyzed by shaking with 20 c.c. of 89% $H_3PO_4$ on the water-bath until all has dissolved, and then steam, free from $CO_2$, is passed through the hot mixture until the vol. in the flask exceeds 75 c.c., but not 100 c.c. and the distillate measures about 450 c.c. The AcOH is then titrated with 0.2N-$Ba(OH)_2$ (phenolphthalein). (Copied complete from British Chemical Abstracts, Journal Society of Chemical Industry, Vol. 51-5, Jan. 29, 1932.) (S)

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YARN TESTING MACHINE CLAMPING DEVICE: IMPROVEMENT.- M. C. Marsh.
Journal of Scientific Instruments, 1931, 8, P. 233-234.

In testing yarns, string, wires, etc., for ultimate strength, breakage often occurs at or very near to the jaws or clamps holding the sample, due to deformation of the sample in clamping. Results from such breakages must be rejected. This difficulty has been completely eliminated by attaching rigidly to each clamp a steel pin so that the yarn or wire may make one or more revolutions round it before entering the clamp. In this way the tension of the yarn as it enters the clamp is greatly reduced (the actual ratio being I to $e^{-2\pi n\mu}$ where $\mu$ is the coefficient of friction and $n$ the number of revolutions round the pin). There is, therefore, little chance of the specimen breaking between the clamp and the pin. A small error is introduced into the measurement of the extension by the end-pieces, but in general this will be much smaller than the experimental error. (Copied complete from the Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932.) (S)

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## BIBLIOGRAPHY

AN INTRODUCTORY STUDY OF TEXTILE MICROBIOLOGY. V.- William G. Chace.
American Dyestuff Reporter, Vol. XXI-3, Feb. 1, 1932, P. 101-103.

This is the fifth in a series of articles and is concerned with the isolation of pure cultures and the sterilization of material. (S)

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PECTOGRAPHY AND THE CONSTITUTION OF COLLOIDAL SOLUTIONS.- E. S. Hedges.
Journal of Society Chemical Industry, Vol. 51-2, Jan. 8, 1932, P. 25-26.

A study of colloidal solutions by means of residues produced by the dessication of the sol and known as a pectograph. The production and study of these patterns is briefly described. (S)

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NEW METALS AND SPEEDS FOR COTTON RING FRAME.- E. E. Blake.
Textile World, Feb. 20, 1932, P. 26-27.

An editorial summary states: "In this article Mr. Blake discusses two subjects: Metallurgical progress as it affects textile machinery, and the selection of suitable spindle speeds. In connection with the latter topic, he explains why lower spindle speeds are necessary when larger rings are employed and why traveler speeds may be increased a certain amount." The article is abstracted from Mr. Blake's address at the Spinning Overseers' Forum held under the auspices of the National Association of Cotton Manufacturers in Boston, Dec. 10, 1931. (S)

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THE SULPHUR CONTENT AND REGAIN OF DESCALED HUMAN HAIR.- N. H. Chamberlain. Journal of the Textile Institute, Vol. XXIII-1, Jan., 1932, P. T13-T16.

A method is described for descaling human hair in reasonable quantity. The results of sulphur determinations on both normal and descaled hair are given, which show that no difference in this respect is to be observed between the two.

It is shown that the regain of human hair is similarly unaffected by removal of the epithelial scales. (S)

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## BOOK REVIEW

CONFERENCE ON COTTON GROWING PROBLEMS, August, 1930. A REPORT AND SUMMARY OF PROCEEDINGS (EMPIRE COTTON GROWING CORPORATION, London, 1930).

A volume of 166 pages devoted to papers and discussions on the following subjects: General problems in the investigation of cotton quality; Immaturity of cotton; The causes of nep in cotton, and the possibilities of its prevention; "New place effect" on cotton; The practicability of obtaining a single variety of cotton suitable to the whole of Uganda; The organization of seed exchange for local experiments; The maintenance of purity of cotton strains under distribution to peasant farmers; Uniformity of cotton: Variation in length, hair weight, etc.; Methods of correlating the strength of cotton yarn with hair properties; Field experiments and the analysis of yield variation in cotton; The inter-relationship of factors in determining the growth of the cotton crop in the Sudan; Black Arm Disease of cotton; Soil erosion; The desirability of interchange of details of methods of measuring "Halo Lengths"; Grafting and graft hybrids in connection with cotton plants; The trials of the latest picking machines in the United States.

Of particular interest are the papers dealing with the uniformity of cotton, methods of correlating the strength of cotton yarn with hair properties, and the causes of nep in cotton. (S)

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## SPECIAL COURSE IN TEXTILE RESEARCH AT M. I. T.

Textile executives, research directors and others are offered a special course in laboratory methods and research in fibres, yarns and fabrics by Massachusetts Institute of Technology, Cambridge, Mass. It is similar in most respects to courses so successfully conducted last year under the direction of Prof. E. R. Schwarz. A class limited to 20 will meet Fridays and Saturdays for six weeks starting March 4, and will receive approximately 100 hours of class room and laboratory work. The Institute textile laboratory has been equipped with a complete system of central-station air conditioning, including dehumidification by refrigeration, and this apparatus will be available for instruction purposes. Tuition for the course is $50. Descriptive pamphlet containing syllabus of lectures on textile analysis and microscopy can be obtained by addressing Prof. George B. Haven or Prof. E. R. Schwarz.

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## U. S. INSTITUTE MEETINGS

Research Committee.- Saturday, March 12th, 10 A. M., Hotel Biltmore, Providence, R. I. (A cordial invitation has been extended to members of U. S. Institute by Committee D-13, of the American Society for Testing Materials, to attend their meetings at the Hotel Biltmore, Providence, R. I., March 10th and 11th.)

Executive Committee.- Friday, March 18th., 10:30 A. M., Chemists' Club, New York City.

Board of Directors and Members.- Friday, April 29th, 10:30 A. M., New York City. Reception and luncheon to be tendered by members to President Francis P. Garvan. Place and hour to be announced later.

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